Forage Quality of Mixtures of *Bromus wildenowii* and *B. parodii* Influenced by Nitrogen Fertilization or Alfalfa Interseeding

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FORAGE QUALITY OF MIXTURES OF *BROMUS WILDENOWII* AND *B. PARODII* INFLUENCED BY NITROGEN FERTILIZATION OR ALFALFA INTERSEEDING.

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Abstract

Under good soil fertility conditions, *Bromus wildenowii* Kunth and *Bromus parodii* Covas et Itria are two high producing forage grasses. The objective of this study was to evaluate the effect of nitrogen fertilization or the association with alfalfa (*Medicago sativa* L) on yield and forage quality of mixtures of both grasses during the establishment year. Nitrogen fertilizer (300 kg ha^{-1}) was broadcasted in three 100 kg N dosis. Nitrogen fertilization or alfalfa intercropping did not increase dry matter yield. Tiller density and crude protein content of grass forage were increased by nitrogen application. Intercropped alfalfa increased N content of grasses mixture. *In vitro* dry matter disappearance, neutral detergent fiber and lignin content were not affected by treatments.

Keywords: forage quality, nitrogen, alfalfa, cool season grasses.

Introduction

Bromus wildenowii is a native cool season grass with wide adaptation and high productivity in Argentina. Its potential is better shown under high fertility conditions. Usually it

is used in mixtures with others cool season grasses or alfalfa. High initial growth, forage quality and seed production capacity under intense defoliation are some of its attributes (Batallanez and Bertín, 1990).

Bromus parodii is also a native forage plant cultivated in semiarid Argentina (Covas and Itria, 1968). During the growing season, *B. parodii* shows a similar initial growth rate than *B. wildenowii*. However it reaches its maximum growth rate about one month later than *B. wildenowii* (Covas *et al,* 1996).

The productivity and forage quality of both species grown in mixture with forage legumes such as alfalfa in southern semiarid Argentina has not been fully explored. Our objective was to evaluate the effect of nitrogen fertilization and the association with alfalfa on yield and forage quality of *B. wildenowii* and *B. parodii* during the first year.

Material and Methods

A field experiment was conducted at the Argerich Experimental Farm of the Universidad Nacional del Sur, near Bahía Blanca, (38º 46´S, 62º 36´W).

On 7 April 1998, the experiment was seeded in a silty soil, using a man-operated one- row seeder (Almaco, IA). The plots were established on a tilled seed bed (plowed, disked and harrowed). Plots (1,5 by 6 m) containing six rows 0.25 m apart were replicated six times in a randomized complete block design. A binary mixture (60% - 40% by weight) of *Bromus wildenowii* Kunth. cv. Martin Fierro and *Bromus parodii*. Covas et Itria., cv. Don Lorenzo, respectively was seeded on twelve plots at 15 kg seed ha^{-1}. The same mixture of *B. wildenowii* and *B. parodii* (7 kg seed ha^{-1}) mixed with alfalfa (*Medicago sativa* L. cv Armona, 10 kg ha^{-1}) was sown on the six remaining plots. Weeds were controlled manually during the experiment.

Treatments were 1) Control 2) N_{300} (300 kg ha $^{-1}$ of N as urea) and 3) Mix/alf (mixture, grasses-alfalfa). Nitrogen fertilizer was broadcasted in three 100 kg ha^{-1} applications (late June 1998; early October 1998 and late April 1999). After establishment, one permanent quadrat (0.04 m^2) was randomly assigned to each plot. Total grass tiller counts were performed in four occasions in every plot: Winter (2 August 1998), Spring (5 October 1998); Summer (7 January 1999) and Fall (6 April 1999).

No insecticide or herbicide was used after plots were sown. Plots were hand harvested initially on 9 November 1998 and regrowths were harvested on 14 January 1998; 29 March 1999 and 4 June 1999. Herbage yield was determined by harvesting a 1.00- by 5.00-m area from each plot at a cutting height of 0.07 m. Herbage weight from each plot was recorded and subsampled for moisture and chemical analysis. Subsamples were dried for 72 h in a forced-air oven a 70º C and grounded to pass a 2 mm screen. In the Mix/alf treatment, legume and grasses forage were hand separated before drying. Crude protein concentrations were determined by macroKjeldahl procedure (AOAC, 1984).

In vitro dry matter digestibility (IVDMD) was assessed according to the two-stage procedure of Tilley and Terry (1963). Neutral detergent fiber (NDF) and lignin (L) were determined according to Goering and Van Soest (1970). Statistical analysis of data was performed with analysis of variance. Means comparisons were made with a Duncan´s multiple range test (Steel and Torrie, 1980).

Results and Discussion

Herbage yield was not affected by treatments (Table 1). In spite of the heavy application of nitrogen, fertilized plots did not produce more forage than the mixture of grasses with alfalfa.

Nitrogen fertilization tended to increase forage production (23%) early in spring, while Mix/alf treatment yielded 14% more forage than the Control at the end of the growing season.

Tiller density was increased by nitrogen fertilization. Mean tiller number on N-fertilized plots was 76% higher than on Control though the nitrogen effects usually is more noticeable in less dense swards (Whitehead, 1995). Also nitrogen fertilization augmented grass tiller number about 114% over Mix/alf treatment. Nitrogen was applied around 40 days before first tiller counting. This could account for the initial higher tiller density observed in fertilized swards compared to the other treatments.

Nitrogen fertilization or association with alfalfa did not affect IVDMD, NDF and L content (Table 2). Instead, the crude protein content of grass herbage is strongly influenced by available soil N level (Follett and Wilkinson, 1995). In this study nitrogen fertilization increased CP content. It is interesting to observe the increase of CP content of both grasses associated with alfalfa (Mix/alf.) compared to the Control treatment. Maximum protein content was obtained late in the growing season (data not-shown).

Nitrogen fertilization or the mixture with alfalfa had no significant effect on dry matter yield. Tiller number and crude protein increased with the appliction of nitrogen. Interseeding with alfalfa improve the crude protein of the grasses but the result was not significant.

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Table 1 - Mean yield and mean tiller number of a binary mixture of *Bromus wildenowii* and B. *parodii* (Control), the same binary mixture plus nitrogen (N_{300}) and the same binary mixture interseeded with alfalfa (Mix/alf).

	Harvest					Counting time				
Treatments	**1**	**2**	**3**	**4**	**Total**	**Winter' 98**	**Spring' 98**	**Sumer' 98**	**Fall' 99**	**Mean**
	----------kg dry matter ha^{-1}----------					----------Number of tillers m^{-2}----------				
Control	1103* a	1036 a	1077 a	686 a	3902 a	1125 bc	1266 b	2000 b	1283 b	1418 b
N_{300}	1356 a	1081 a	983 a	658 a	4078 a	2191 a	2308 a	3270 a	2250 a	2504 a
Mix/alf.	1186 a	1199 a	1285 a	788 a	4450 a	806 c	1260 b	1654 b	960 c	1170 b

*Values within a column followed by the same letter are not significantly different at the 0.05 level using Duncan´s multiple range test.

Table 2. Mean *in vitro* dry matter disappearance (IVDMD), neutral detergent fiber (NDF), lignin (L) and crude protein (CP) content of a binary mixture of *Bromus wildenowii* and B. *parodii* (Control), the same binary mixture plus nitrogen (N_{300}) and the same binary mixture interseeded with alfalfa (Mix/alf).

Treatments	IVDMD	NDF	L	CP
	---------- % ----------			
Control	59.1* a	42.7 a	6.29 a	7.62 b
N_{300}	56.6 a	46.2 a	6.47 a	11.83 a
Mix/alf.	61.7 c	48.9 a	6.99 a	10.41 ab

*Values within any column followed by the same letter are not significantly different at the 0.05 level using Duncan´s multiple range test.